



U.S. Patent Application Serial No. **09/475,991**  
Reply to OA dated June 8, 2006

**AMENDMENTS TO THE CLAIMS:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

**Claims 1-7 (canceled).**

**Claim 8 (previously presented):** A document image processing device, comprising:  
character region extracting unit extracting character regions respectively from a plurality of document images which are partitioned and read;

overlapping detecting unit detecting character regions whose matching degrees are high by making a comparison between positions and sizes of the respective character regions extracted by said character region extracting unit, and detecting an overlapping of the plurality of document images based on positions of the detected character regions whose matching degrees are high; and

image merging unit merging the plurality of document images at an overlapping position detected by said overlapping detecting unit, wherein said overlapping detecting unit detects an overlapping position sequentially from a direction with a higher priority among a plurality of detection directions.

**Claim 9 (original):** The document image processing device according to claim 8,  
wherein said overlapping detecting unit determines an overlapping position detection

direction depending on whether or not the document images are written either vertically or horizontally.

**Claims 10-14 (canceled).**

**Claim 15 (previously presented):** A document image processing device comprising:

region partitioning unit partitioning first and second document images which are partitioned and read, respectively into a plurality of vertical and horizontal regions;

line image extracting unit extracting line images containing only character images from the plurality of vertical and horizontal regions partitioned by said region partitioning unit;

region judging unit comparing between the number of line images containing only character images in the plurality of regions vertically partitioned and the number of such line images found in the plurality of regions horizontally partitioned, and judging the plurality of regions that hold more line images found to contain only character images as a low graphics-ratio region;

overlapping detecting unit detecting an overlapping position between the first and second document images, based on positions of character regions whose matching degrees are high by making a comparison between a character region of a line image in a region judged as a low graphics-ratio region by region judging unit and a character region of a line image in a corresponding region of the second document image; and

image merging unit merging first and second document images at the overlapping position detected by said overlapping detecting unit.

**Claim 16 (previously presented):** A document image processing device, comprising:

region partitioning unit partitioning first and second document images which are partitioned and read, respectively into a plurality of vertical and horizontal regions;

line image extracting unit extracting line images containing only character images from the plurality of vertical and horizontal regions partitioned by said region partitioning unit;

region judging unit comparing between the number of line images containing only character images in the plurality of regions vertically partitioned and the number of such line images found in the plurality of regions horizontally partitioned, and judging the plurality of regions that hold more line images found to contain only character images as a low graphics-ratio region;

character recognizing unit recognizing character images in the line images in the region judged as a low graphics-ratio region by the region judging unit;

overlapping detecting unit detecting an overlapping position between the first and second document images, based on a character recognition result of the low graphics ratio region in the first document, and a character recognition result of a corresponding region in the second document; and

image merging unit merging the first and second document images at an overlapping position detected by said overlapping detecting unit.

**Claim 17 (canceled).**

**Claim 18 (original):** The document image processing device according to claim 15, wherein:

said region partitioning unit partitions the plurality of document images into a plurality of regions in a vertical and a horizontal direction; and

said line image extracting unit makes a comparison between the number of line images extracted from a region partitioned in the vertical direction in the plurality of document images and the number of line images extracted from a region partitioned in the horizontal direction, and recognizes a line image direction of a region including a larger number of line images as a line image direction of the plurality of document images.

**Claim 19 (original):** The document image processing device according to claim 15,

wherein said line image extracting unit detects pixels for one pixel line in a partitioned region, and detects pixel lines including a predetermined or larger number of black pixels as black pixel lines, and other lines as white pixel lines.

**Claim 20 (original):** The document image processing device according to claim 19, wherein said line image extracting unit detects pixels in the partitioned regions in line units in a direction vertical to a partitioning bar of the regions partitioned by said region partitioned unit.

**Claim 21 (original):** The document image processing device according to claim 19, wherein said line image extracts as a black pixel region a region where the number of successive black pixel lines is within a predetermined range.

**Claim 22 (original):** The document image processing device according to claim 21, wherein said line image extracting unit extracts as a white pixel region a region where the number of successive white pixel lines is equal to or larger than a predetermined value.

**Claim 23 (original):** The document image processing device according to claim 15, wherein said region partitioning unit changes a partitioned region size depending on a resolution of a read document image.

**Claim 24 (original):** The document image processing device according to claim 21, wherein said line image extracting unit changes the number of black pixel lines regarded as black pixel regions depending on a resolution of a read document image.

**Claim 25 (previously presented):** The document image processing device according to claim 21,

wherein said line image extracting unit extracts a black pixel region adjacent a white pixel region satisfying a predetermined condition as a line image.

**Claim 26 (original):** The document image processing device according to claim 18, wherein said overlapping detecting unit detects character regions whose matching degrees are high as an overlapping position by making a comparison between character regions in the line images in the plurality of partitioned region in the direction of the larger number of line images, which are extracted by said line image extracting unit.

**Claim 27 (original):** The document image processing device according to claim 15, wherein said overlapping detecting unit stores a detection frequency of a line image which was previously detected as an overlapping position of a document image in correspondence with identification information assigned to the line image, and detects an overlapping position by giving precedence to a line image with a high detection frequency.

**Claim 28 (original):** The document image processing device according to claim 15, wherein said overlapping detecting unit makes a comparison between the line images in the respective regions in a predetermined order.

**Claims 29-31 (canceled).**

**Claim 32 (previously presented):** A document image merging method, comprising:

partitioning first and second document images from among a plurality of document images which are partitioned and read, respectively into a plurality of vertical and horizontal regions;

extracting line images containing only character images from the plurality of vertical and horizontal regions partitioned;

comparing between the number of line images containing only character images in the plurality of regions vertically partitioned and the number of such line images found in the plurality of regions horizontally partitioned, and judging the plurality of regions that hold more line images found to contain only character images as a low graphics-ratio region;

detecting an overlapping position between the first and second document images, based on positions of character regions whose matching degrees are high by making a comparison between a character region of a line image in a region judged as the low graphics-ratio region and a character region of a line image in a corresponding region of the second document image; and

merging the first and second document images at the detected overlapping position.

**Claim 33 (previously presented):** A document image merging method, comprising:

partitioning first and second document images among a plurality of document images which are partitioned and read, respectively into a plurality of vertical and horizontal regions;

extracting line images containing only character images from the plurality of vertical and horizontal regions partitioned;

comparing between the number of line images containing only character images in the plurality of regions vertically partitioned and the number of such line images found in the plurality of regions horizontally partitioned, and judging the plurality of regions that hold more line images found to contain only character images as a low graphics-ratio region;

recognizing character images in character regions in the line images in the low graphics-ratio region;

detecting an overlapping position between the first and second document images, based on character recognition results of the low graphics-ratio region and a character recognition result of a corresponding region in the second document image; and

merging the first and second document images at the detected overlapping position.

**Claim 34 (previously presented):** A document image merging method, comprising:

partitioning first and second document images among a plurality of document images which are partitioned and read, respectively into a plurality of vertical and horizontal regions;

extracting line images containing only character images from the plurality of vertical and horizontal regions partitioned;

comparing between the number of line images containing only character images in the plurality of regions vertically partitioned and the number of such line images found in the plurality



of regions horizontally partitioned, and judging the plurality of regions that hold more line images found to contain only character images as a low graphics-ratio region;

detecting an overlapping position between the first and second document images based on positions of the extracted line image whose matching degrees are high by making a comparison between a character region of a line image in a region judged as the low graphics-ratio region and a character region of a line image in a corresponding region of the second document image; and merging the first and second document images at the detected overlapping position.

**Claim 35 (previously presented):** A document image merging method, comprising:  
making a display to allow a setting of whether or not to automatically merge a plurality of document images which are partitioned and read on a display screen;

partitioning first and second document images among the plurality of document images among the plurality of document images which are partitioned and read, respectively into a plurality of vertical and horizontal regions;

extracting line images containing only line character images from the plurality of vertical and horizontal regions partitioned;

comparing between the number of line images containing only character images in the plurality of regions vertically partitioned and the number of such line images found in the plurality of regions horizontally partitioned, and judging the plurality of regions that hold more line images found to contain only character images as a low graphics -ratio region;

recognizing character images in character regions within the extracted line images;  
detecting an overlapping position of the first and second document images, based on positions of character regions whose matching degrees are high by making a comparison between character region of a line image in the low graphics-ratio region and a region of a line image in a corresponding region of the second document image.

**Claims 36-37 (canceled).**

**Claim 38 (previously presented):** A computer-readable storage medium on which is recorded a program for causing a computer to execute a document image merging process, said process comprising:

partitioning first and second document images among a plurality of document images which are partitioned and read, respectively into a plurality of vertical and horizontal regions;

extracting line images containing only character images from the plurality of vertical and horizontal regions partitioned;

comparing between the number of line images containing only character images in the plurality of regions vertically partitioned and the number of such line images found in the plurality of regions horizontally partitioned, and judging the plurality of regions that hold more line images found to contain only character images as a low graphics-ratio region;

detecting an overlapping position between the first and second document images based on positions of character regions whose matching degrees are high by making a comparison between a character region of a line image in the low graphics-ratio region and a character region of a line image in a corresponding region of the second document image; and

merging the first and second document images at the detected overlapping position.

**Claim 39 (previously presented):** A computer-readable storage medium on which is recorded a program for causing a computer to execute a document image merging process, said process comprising:

partitioning first and second document images among a plurality of document images which are partitioned and read, respectively into a plurality of vertical and horizontal regions;

extracting line images containing only character images from the plurality of vertical and horizontal regions partitioned;

comparing between the number of line images containing only character images in the plurality of regions vertically partitioned and the number of such line images found in the plurality of regions horizontally partitioned, and judging the plurality of regions that hold more line images found to contain only character images as a low graphics-ratio region;

recognizing character images within character regions in the line images in the regions judged as a low graphics-ratio region;

detecting an overlapping position between the first and second document images based on a character recognition result of the low graphics-ratio region and a character recognition result of a corresponding region in the second document image; and

merging the first and second document images at the detected overlapping position.

**Claim 40 (previously presented):** A computer-readable storage medium on which is recorded a program for causing a computer to execute a document image merging process, said process comprising:

making a display to allow a setting of whether or not to automatically merge a plurality of document images which are partitioned and read on a display screen;

partitioning first and second document images among the plurality of document images, respectively into a plurality of vertical and horizontal regions;

extracting line images containing only characters images respectively from the plurality of vertical and horizontal regions partitioned;

recognizing character images in character regions within the extracted line images;

comparing between the number of line images containing only character images in the plurality of regions vertically partitioned and the number of such line images found in the plurality of regions horizontally partitioned, and judging the plurality of regions that hold more line images found to contain only character images as a low graphics-ratio region;

detecting an overlapping position between the first and second document images based on positions of character regions whose matching degrees are high by making a comparison between a character region of a line image in the region judged as a low graphics-ratio region and a character region of a line image in a corresponding region of the second document image; and  
merging the first and second document images at the detected overlapping position.

**Claim 41 (canceled).**